DOCUMENT RESUME

ED 274 678 TM 860 538

AUTHOR Noble, Robert F.
TITLE Multiple Regression Analysis of Six Predictor Variables of Academic Achievement in the Course Introduction to Research.
PUB DATE Apr 86
NOTE 12p.; Paper presented at the Annual Meeting of the American Educational Research Association (67th, San Francisco, CA, April 16-20, 1986).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Academic Achievement; *College Entrance Examinations; Correlation; *Grade Point Average; Graduate Students; Higher Education; Hypothesis Testing; *Majors (Students); *Predictor Variables; *Regression (Statistics)
IDENTIFIERS Graduate Record Examinations

ABSTRACT

The purpose of this research was to determine, through multiple regression analysis, the strength of the relationship of each of six predictor variables (undergraduate major, undergraduate grade-point average (GPA), graduate major, graduate GPA, Graduate Record Examinations (GRE) Quantitative score, and GRE Verbal score) to academic achievement (in numerical form) in an introductory research course. The following conclusions were made: (1) of the six predictor variables, the strongest predictor of the final grade in the course was the cumulative graduate GPA of the student; (2) second in predictive power, but of considerably lesser strength, was the GRE Qualitative scale; (3) the undergraduate GPA and GRE Verbal scale appeared to be of little added predictive value; (4) the undergraduate major of the graduate student has little or no value in predicting the outcome grade in the introductory research course. (Author/JAZ)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED274678

Multiple Regression Analysis of Six Predictor Variables of Academic Achievement in the Course Introduction to Research

Robert F. Noble

University of Wyoming

Laramie, Wyoming

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

R. Noble

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Paper presented at

American Educational Research Association

San Francisco, California

April 1986

TM 860 538

ABSTRACT

Multiple Regression Analysis of Six Predictor Variables of Academic Achievement in the Course Introduction to Research

The purpose of this research was to determine, through multiple regression analysis, the strength of relationship of each of six predictor variables (undergraduate major, undergraduate gpa, graduate major, graduate gpa, GRE Quantitative score, and GRE Verbal score) to academic achievement (in numerical form) in an introductory research course.

The strongest predictor was concluded to be the current graduate grade point average. The GRE Quantitative score, undergraduate gpa, and the GRE Verbal score appeared to be of considerably less predictive power. The undergraduate major seemed to be of little or no value in prediction.

Multiple Regression Analysis of Six Predictor Variables of Academic Achievement in the Course Introduction to Research

Persons who teach often ask themselves why some students are "successful" in their classes and others are "unsuccessful." Research instructors ask: "Why do some students quickly see the logic, processes, and terminology of quantitative research, while other students experience considerable difficulty?" Among other possible causes, college instructors commonly concern themselves with background factors of the student and to what extent these maybe related to course outcomes. Yet, the reasons for differences in student achievements in research courses may be unclear.

Objectives. The primary objective of this research was to determine the effectiveness of each of six predictor variables in the backgrounds of graduate students in the College of Education, University of Wyoming, in predicting the criterion variable of academic achievement in Introduction to Research classes.

Specific objectives (stated in the research report as correlational hypotheses) were to determine:

1. Will the obtained multiple R in the population be significantly different from 0?
2. Will the addition of any one or more predictor variables in the stepwise analysis lead to a significant increase in the coefficient of multiple R?
3. Will any of the derived beta weights differ significantly from 0?
4. Will any of the simple bivariate correlations differ significantly from 0?

Perspectives. While there has been extensive research done in predicting degree completion (Lewis & Kim, 1982), student persistence

(Dressel & Simpson, 1982), characteristics of completers (Hill, 1981), and attrition (Monroe, 1983), this researcher could find none predicting academic success in research courses. The most common and stable predictor of other criterion variables seemed to be the cumulative grade point average (Lemp, 1980). Other predictors which had been analyzed were such variables as nature and amount of work demanded, faculty-student rapport, academic status, demographic background, and course content.

Data Source. The course Introduction to Research is a required component in all master's level graduate programs in the College of Education at the University, although a few doctoral level students who have not had an equivalent also take it. Two sections are offered each semester, of which the investigator teaches one. Data were collected concerning 126 students who had enrolled in 11 classes taught by the investigator in 1981, 1982, and 1983. Names were limited to those on whom all necessary data were available. Data were secured from the Office of the Registrar at the University.

Methods. Since the investigator was seeking to determine the relative strengths of six predictor variables with one criterion variable measured on interval data, multiple regression appeared to be the appropriate analysis. Predictors used were: undergraduate major (dummy variables: math or science=0, humanities major=1); cumulative undergraduate gpa; cumulative graduate gpa; graduate major (dummy variables: math or science=0, humanities=1); Graduate Record Examination, Aptitude Form, Quantitative Scale; and Graduate Record Examination, Aptitude Form, Verbal Scale.

The criterion variable was the total cumulative points (from which grades were derived) achieved by each student. The investigator used a

cumulative point system totalling a constant possible 355. An "A" would constitute the achievement of 90 percent of those points or higher; a "B," 80 percent; and so forth. Five predictors were gathered from retrospective data; graduate grade point average was assessed in the concurrent semester with the criterion.

Data analysis. First, the independent predictive power of the variables was examined. They appear in the following table:

Table 1

SIMPLE BIVARIATE CORRELATIONS AMONG THE SEVEN VARIABLES

	UN MAJOR**	UN GPA	GR GPA	GR MAJOR	GRE QS	GRE VS
UN GPA**	.073[+]					
GR GPA**	-.003	.170				
GR MAJOR**	.353	.012	-.042			
GRE QS**	.053	.100	.331	-.090		
GRE VS**	.009	.170	.224*	.008	.687*	
ACHIEV	-.013	.150	.615*	-.082	.284*	.268*

[+]Decimal values were reduced to three places
*p < .01 with 125 df
**UN GPA = undergraduate grade point average
GR GPA = graduate grade point average
GR MAJOR = graduate major (dummy variables)
GRE QS = Graduate Record Examination, Quantitative scale
GRE VS = Graduate Record Examination, Verbal scale
ACHIEV = course score (total points achieved)
UN MAJOR = undergraduate major (dummy variables)

A multiple regression was performed using subprogram regression in the SPSS package. The New Regression of the updated manual was originally selected for this analysis, but in Spring, 1984, only the stepwise approach was available for the CDC 180/835. Since the independent strength of each of the added variables is masked in this approach, second and third programs were run differing in the order of the predictors to determine the degree of linear dependence of the achieved cumulative score in the research class on each of the predictors. Placed earlier in the stepwise analysis of the second and third runs were those predictors which were expected to be potent and whose independent power might have been absorbed in the stepwise regression of the original run. The first program run was reduced to the following:

TABLE II

SUMMARY OF THE FIRST STEPWISE REGRESSION

Step	Entered Variable	F to enter	Sig. Level	Multiple R	R^2	R^2 Change	Overall F
1	GR GPA	75.514+	0	.615	.378	.378	75.514
2	GRE VS	3.596	.060	.629	.396	.018	40.345
3	GR MAJOR	.696	.406	.632	.400	.003	27.062
4	UN GPA	.173	.678	.633	.400	.001	20.202
5	GRE QS	.021	.885	.633	.400	.000	16.035

+Decimal values reduced to three places

Because it was possible that the bivariate strengths of the two GRE predictors, particularly, were hidden in the first stepwise analysis, (in which the strength of the GRE Quantitative scale appeared to be masked) a second program was run which forced these two variables to be entered prior to the other three. The following summarizes this second regression analysis:

TABLE III

SUMMARY OF THE SECOND STEPWISE REGRESSION

Step	Entered Variable	F to enter	Sig. Level	Multiple R	R^2	R^2 Change	Overall F
1	GRE QS	10.879[+]	.001	.284	.081	.081	10.879
2	UN MAJOR	1.343	.249	.301	.091	.010	6.127
3	GR GPA	61.737	.000	.629	.396	.306	26.680
4	GR MAJOR	.158	.692	.630	.397	.001	19.912
5	UN GPA	.042	.839	.630	.397	.000	15.812

[+]Decimal values reduced to three places

A third run of the program was made with the graduate grade point stipulated first on the variable list. This variable, however, had an F to enter of only .841 with a significance of .361. The summary table of the third run, then, provided little additional information:

TABLE IV

SUMMARY OF THE THIRD STEPWISE REGRESSION

Step	Entered Variable	F to enter	Sig. Level	Multiple R	R^2	R^2 Change	Overall F
1	GRE MAJOR	.841+	.361	.082	.007	.007	.841
2	GR GPA	74.575	0	.618	.381	.375	37.958
3	GRE VS	3.641	.059	.632	.400	.018	27.062
4	UN GPA	.173	.678	.633	.400	.001	20.202
5	GRE QS	.021	.885	.633	.401	.000	16.035

+Decimal values reduced to three places

Beta weights. The beta weights entered on step five of the first two runs were as follows:

TABLE V

BETA WEIGHTS

Variable	Beta weights	Elasticity	t
GRE MAJOR	-.060+	-.015	-.847
GR GPA	.580	.353	7.773*
GRE VS	.143	.040	1.447
UN GPA	.029	.011	.405
GRE QS	-.015	-.004	-.145

+Decimal values reduced to three places
*$p < .01$ with 125 df

Results and conclusions. The specific objectives, stated in question form on page one, were tested as correlational hypotheses at the .01 level with the following results:

Hypothesis one, that the obtained coefficient of multiple R in the population will not differ significantly from 0, was rejected. No R value was less than .615, significant beyond the .001 level.

Hypothesis two, that the addition of any one or more predictor variables in the stepwise analysis will not lead to a significant increase in the coefficient of multiple R, could not be rejected. While no partial F test was run to test the hypothesis, the strength of the second predictor (graduate grade point average) entered in step one of the first run was such that no variable entered thereafter made a significant contribution. The investigator would caution, however, that the strength of this variable may have been due at least partially to measure of that variable concurrently with the criterion variable.

Hypothesis three, that none of the derived beta weights will differ significantly from 0, was rejected. The graduate grade-point average had a beta weight of .580, $t=7.663$, $p<.01$ with 125 df.

Hypothesis four, that none of the simple bivariate correlations will differ significantly from 0, was rejected. The GRE Verbal Scale scores with the graduate gpa's and with the GRE Quantitative scale scores, and course achievements with with graduate grade point averages, with the GRE Quantitative scale scores, and with GRE Verbal scale scores were significant at the .01 level with 125 df.

Conclusions. On the basis of the evidences provided with appropriate caution, the following conclusions appear warranted:

1. Of the six predictor variables entered, the strongest predictor of the final grade in Introduction to Research, as taught by this investigator, was the cumulative graduate grade point average of the student.
2. Second in predictive power, but of considerably lesser strength, was the GRE Quantitative scale.
3. The undergraduate grade point average and GRE Verbal scale appeared to be of little added predictive value.
4. The undergraduate major of the graduate student has little or no value in predicting the outcome grade in the introductory research course.

SELECTED REFERENCES

Dressel, P. L., & Simpson, W. A. (1982). Student persistence and benefits: Program selection and degree completion. Washington, DC: U.S. Government Printing Office. (ERIC Document Reproduction Service No. ED 209 996)

Hill, S., et al. (1981). Characteristics of postsecondary students twenty five years and older. Washington, DC: U.S. Government Printing Office. (ERIC Document Reproduction Service No. ED 221 125)

Lemp, P. H. (1980). Determinants of persistence in graduate education: The doctoral level. Unpublished doctoral dissertation, Palo Alto, CA: Stanford University.

Lewis, J., & Kim, N. (1982). Persistence toward a degree in urban non-residential universities. Washington, DC: U.S. Government Printing Office. (ERIC Document Reproduction Service No. ED 463 990)

Monroe, J. A. (1983). Predicting student progression: The influence of race and other student and institutional characteristics in college student performance. Washington, DC: U.S. Government Printing Office. (ERIC Document Reproduction Service No. EJ 281 248)